California Environmental Protection Agency

Air Resources Board

Gasoline Dispensing Facility (GDF)
Vapor Recovery Hose Population Report

Prepared By:

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Introduction

In January of 2008, California Air Resources Board (CARB) staff conducted a survey of Air Pollution Control Districts (APCDs) within California to determine the population of vapor recovery hoses at permitted gasoline dispensing facilities (GDFs). In order to get a detailed population estimate, CARB staff requested information on: GDF population, hose population, hose dimensions, and GDF throughput. Twenty-eight of the of the thirty-five California APCDs responded to CARB's survey. From this response, CARB staff estimates that there are approximately 173,257 vapor recovery hoses in use at permitted GDFs in California. The survey further indicates that approximately 85% (146,750) of these hoses are balance style hoses and the remaining 15% (26,507) are vacuum assist style hoses.

Background

It is part of CARB's mission to promote and protect the public health and welfare through the effective and efficient reduction of air pollutants. In carrying out this mission, CARB, in cooperation with local APCDs, has sought to control hydrocarbon emissions at GDFs in California since 1975. Hydrocarbon emissions are reactive organic gases which can react in the atmosphere to form photochemical smog. Recently, CARB staff has identified GDF hoses as a source of uncontrolled reactive organic gas emissions due to gasoline's ability to permeate through common GDF hose materials.

Under the California Health and Safety Code, Section 41954, it is CARB's responsibility to adopt certification procedures for evaporative emissions control systems for use at GDFs. It is the local APCD's responsibility to regulate GDFs and issue them permits to operate. Because the APCDs are responsible for permitting GDFs, staff believes that they are the best source of detailed information available for developing a California GDF hose population.

California GDFs, with few exceptions must use vapor recovery style hoses. A vapor recovery hose is different from a conventional fuel delivery hose in that it has two paths: one for fuel delivery and the other for vapor return. There are two different styles of vapor recovery hose: balance and vacuum assist. For permeation purposes, vacuum assist hoses are similar to standard fuel delivery hoses in that the liquid fuel is carried against the inside of the outer hose wall. Balance hoses are different, carrying vapor against the outer hose wall (Figure 1).

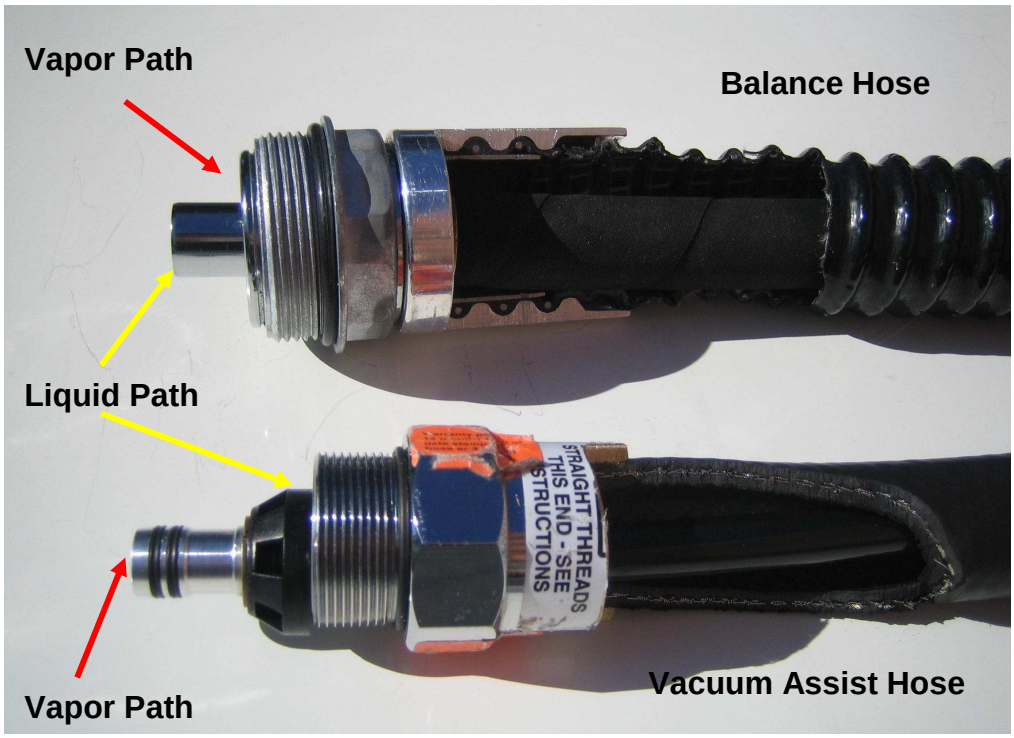

Figure 1. Cutaways of vapor recovery GDF hose showing vapor and liquid paths.

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The Survey

As part of staff's effort to quantify the number of vapor recovery hoses in use within California, staff conducted a GDF hose population survey (Attachment 1). The survey requested population data corresponding to December 31st, 2007. All thirty-five of California's APCD's were sent the survey via mail.

Staff's ultimate objective in conducting this survey was determining the population for vapor recovery hoses in California. This is because only vapor recovery hoses are certified for use on CARB certified vapor recovery systems. Thus, hoses that are in-use at permitted GDFs that are not required to have a CARB certified vapor recovery system fall outside of CARB's current regulatory authority with respect to GDF hoses. From the survey data (Attachments 2 and 3), staff estimates that approximately 2% of the statewide GDF hose population are non-vapor recovery hoses.

The survey requested information on four topics. These included: GDF population, hose population, hose dimensions, and GDF throughput. GDF population numbers were requested to help characterize the number of hoses per GDF. Hose population numbers were requested to determine a precise GDF hose count within California. Hose dimension numbers were requested to help generate average hose characteristics for the purposes of calculating permeation estimates that are based upon material surface area. GDF throughput information

was requested to see if there were any correlations that could be drawn between throughput of a GDF and the number of hoses at that GDF.

Survey Response

Of the thirty-five California APCDs, twenty-eight responded to CARB's survey. Of the twenty-eight districts that responded to the survey, only twenty-six responded to the section on hose population. Several follow-up attempts were made by CARB staff via phone and/or email to obtain 100% response for this survey, however these districts remained unresponsive. Results of the survey can be found in Attachments 2 and 3.

From the survey data, staff found the total permitted GDF population employing Phase II vapor recovery to be 14,438 (Attachment 2). The vapor recovery hose population was determined to be 173,257 (Figure 2). The survey further shows that 85% (146,750) of vapor recovery hoses are balance style hoses and the remaining 15% (26,507) are vacuum assist style hoses.

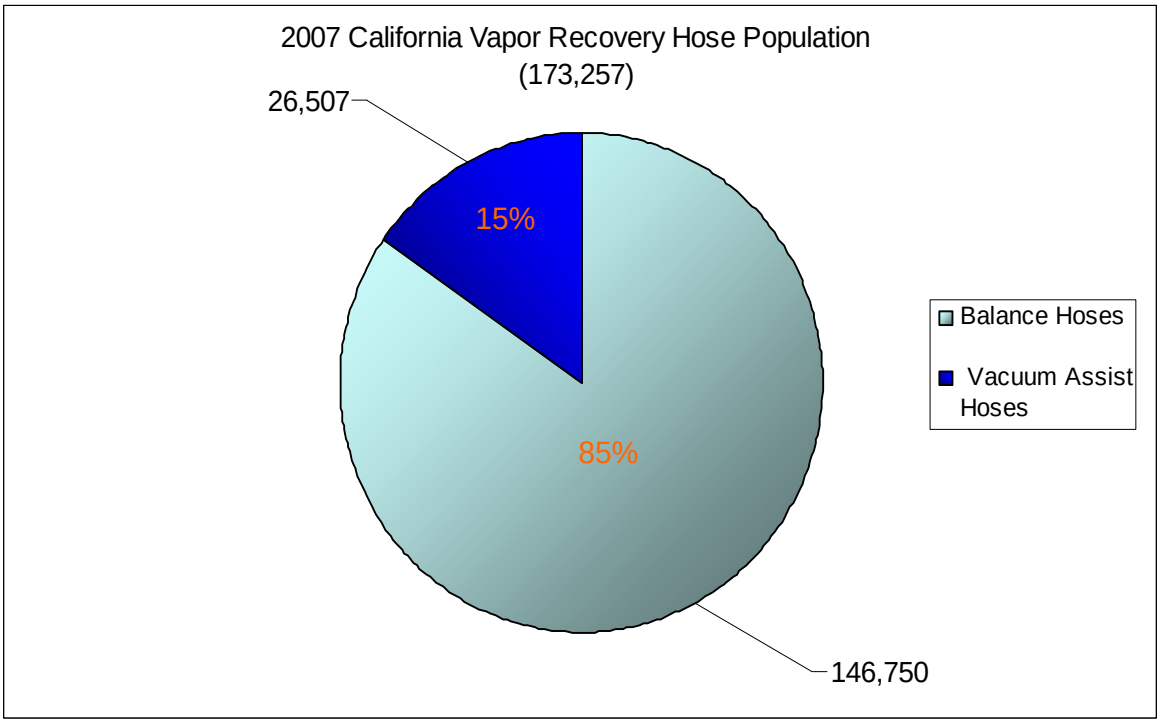

Figure 2. 2007 California Vapor Recovery Hose Population Chart.

Very few districts submitted survey responses for the sections on GDF hose dimensions and GDF throughput. In the case of hose dimensions, staff found that this is not typically data that districts maintain. In the case of throughput, data

simply was not submitted by most districts. Therefore, CARB staff did not attempt to make any analysis regarding these hose population characteristics in this report.

Correcting the Survey for Unresponsive Districts

For the districts that failed to respond, GDF populations were derived by determining the average number of GDFs per district based upon district population density (Attachment 4). Population densities were derived from population and land area data from the 2000 U.S. Census.[1] Although it must be noted that the population density data is valid for the year 2000 and this survey has recorded GDF hose population data relevant to 2008, staff believes that the Census data is still useful as a tool to accurately determine GDF population. This is based upon the assumption that although the California population will have increased between 2000 and 2007, the relative population distribution throughout the State will be the very nearly the same. The estimated GDF populations for these districts can be found in Attachment 2. It is staff's estimate that these districts, together, make up approximately 4% of the statewide permitted GDF population and approximately 3% of the statewide vapor recovery hose population.

GDF hose populations were then derived for these districts by calculating the average number of hoses per GDF type from the reporting districts and multiplying these numbers by the estimated station counts that had been determined based upon population density. Staff used representative districts when calculating the number of hoses per GDF to apply to the unresponsive districts. The estimated GDF hose populations for these districts can be found in Attachment 3.

Balance / Vacuum Assist Hose Population Breakdown

This survey demonstrated that, for 2007, balance style hoses make up approximately 85% of the vapor recovery hose population while vacuum assist style hoses make up the other 15% of that population (Figure 2). However, staff is aware that there are large numbers of recent applications at the district level from GDF owners requesting to switch from balance vapor recovery systems to vacuum assist vapor recovery system. This trend has been driven in large part by station owners trying to meet Enhanced Vapor Recovery certification requirement deadlines that occur in April of 2009. Thus, staff assumes that when projecting the GDF hose population out to the year 2014, it is likely that balance and vacuum assist hoses will likely each constitute 50% of the vapor recovery hose population within California. However, other market trends could impact this estimate.

South Coast Hose Population

The South Coast District reported in the survey that their vapor recovery GDF hose population is 100,860. Staff observed that while the South Coast District comprises about 44% of the State's population, it comprises approximately 58% of the vapor recovery hose population. CARB staff asked follow-up questions of South Coast staff regarding this observation. The justification given was that South Coast has a large number of GDFs that employ "six-pack" dispensers. Six-pack dispensers employ 3 hoses for each fueling point, one hose for each octane grade of gasoline: 87, 89, and 91. Most conventional dispensers have ratio of 1 hose per fueling point. Dispensers, whether six-packs or not, generally have 2 fueling points. Therefore, a six-pack dispenser has 6 hoses instead of the conventional 2 hoses, tripling the number of hoses that would normally be employed at a GDF. The average number of vapor recovery hoses per GDF in the South Coast District was calculated by CARB staff to be approximately 20. However, a GDF with a modest 8 fueling points employing six-pack dispensers would have 24 hoses instead of the normal 8 hoses. Therefore, since South Coast staff reports having a large number of GDFs with six-pack dispenser, CARB staff believes that the data submitted is reasonable.

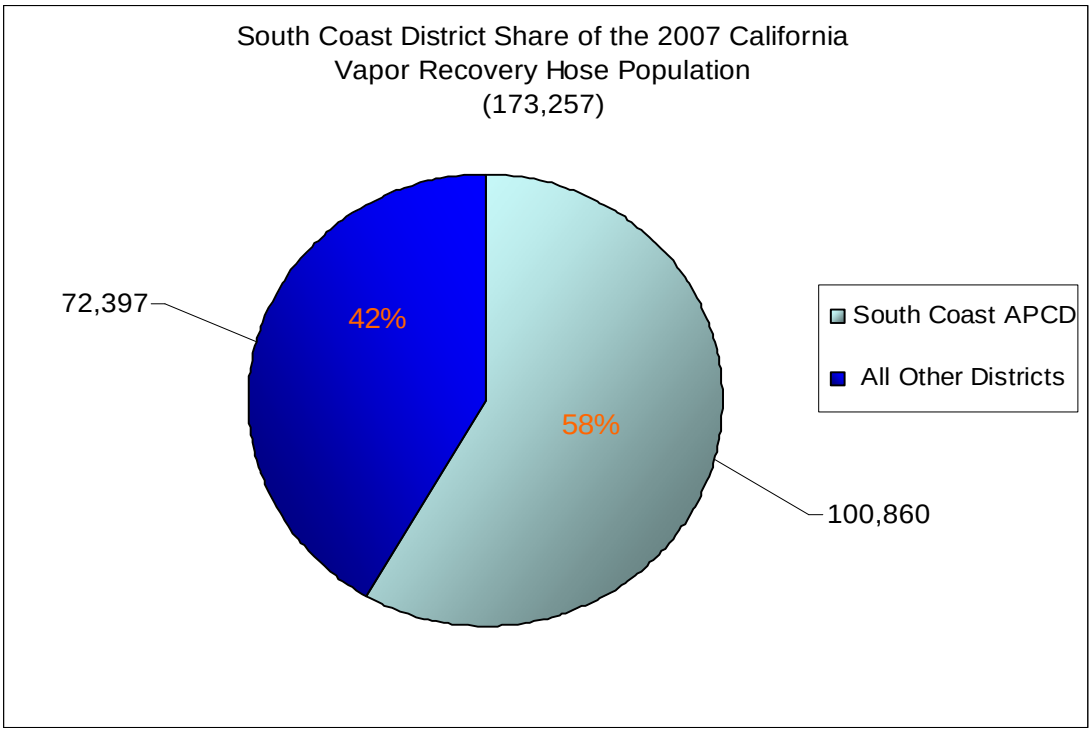

Figure 3. South Coast District's share of the 2007 vapor recovery hose population.

AST / UST Hose Population Breakdown

This survey did not address the population breakdown between permitted GDFs employing underground storage tanks (USTs) and those employing aboveground storage tanks (ASTs). This distinction is significant in that the GDFs employing USTs fall under a different CARB certification procedure than those GDFs employing ASTs, and are thus regulated differently. From an AST population survey of APCDs conducted by CARB staff in 2006, staff determined that there were approximately 2,348 permitted GDFs with Phase II vapor recovery employing ASTs within California.[2] Staff believes that these GDFs would likely employ an average of 2 hoses each. Thus, staff estimates that that vapor recovery hose population employed at GDFs using ASTs is approximately 4,696 (2%),and the vapor recovery hose population employed at GDFs using USTs is approximately 169,247 (98%).

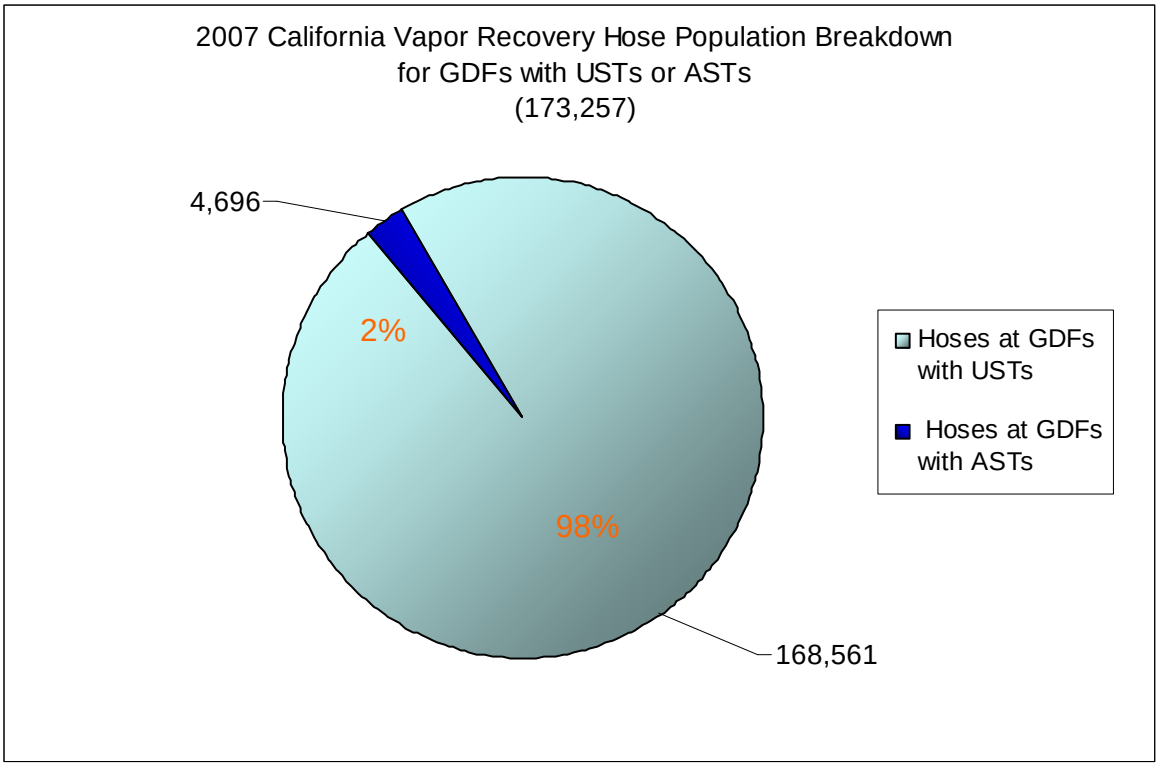

Figure 4. UST / AST 2007 Vapor Recovery Hose Populations.

Retail / Non-Retail GDF Population Breakdown

The Survey did not address the population breakdown between retail and non-retail GDFs. However, the 2006 National Petroleum News Survey of retails GDFs[3] shows that in the first quarter of 2006, California had 9,857 retail GDFs. Because nearly all of these would likely fall under the category of permitted GDFs with phase II vapor recovery, staff estimates that there are approximately 4,600 non-retail permitted GDFs with phase II vapor recovery in California. Staff did not have enough data to determine the numbers of hoses that were used at retail GDFs and non-retail GDFs although staff believes that the number of hoses used at retail GDFs is generally greater than the number of hoses used at non-retail GDFs.

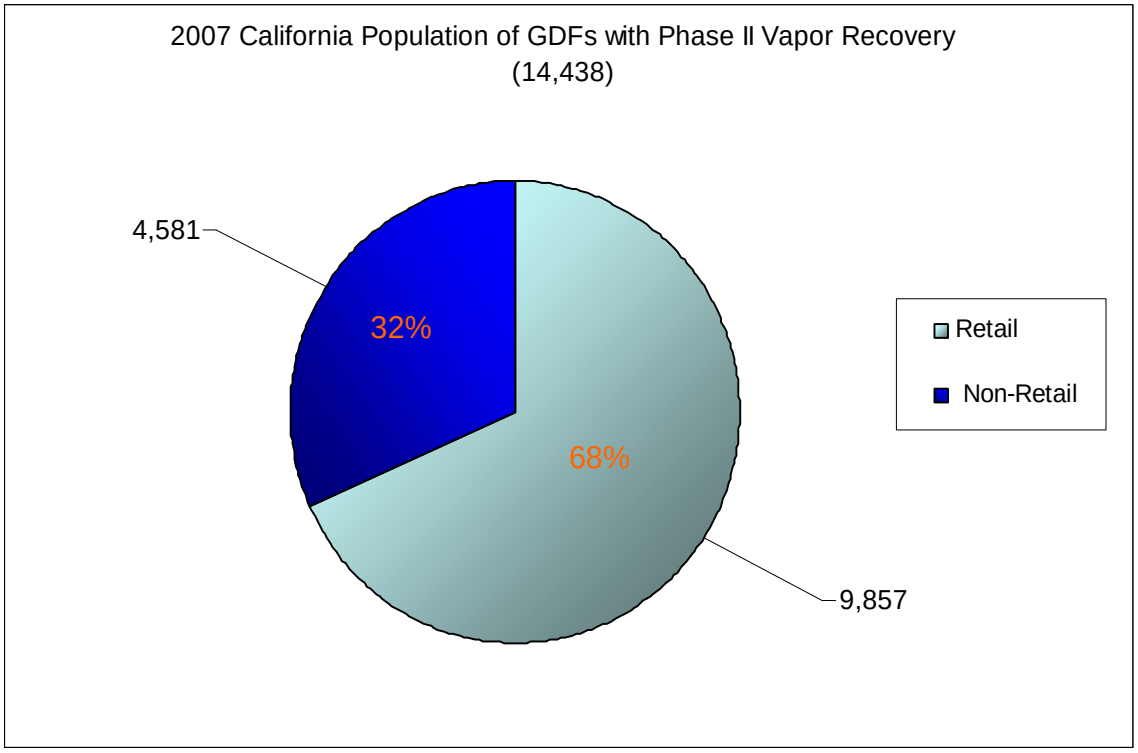

Figure 5. 2007 retail and non-retail population estimate of GDFs with vapor recovery.

Conclusion

Based upon the survey results, CARB staff estimates that there are approximately 173,257 vapor recovery hoses in use at permitted GDFs in California. The survey further indicates that approximately 85% (146,750) of these hoses are balance style hoses and the remaining 15% (26,507) are vacuum assist style hoses.

Works Cited

[1] United States. U.S. Census Bureau. GCT-PH1. Population, Housing Units, Area, and Density: 2000 Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data Geographic Area: California – County. U.S. Census Bureau, 2001. <http://factfinder.census.gov/servlet/GCTTable?_bm=y&-ds_name=DEC_2000_SF1_U&-CONTEXT=gct&-mt_name=DEC_2000_SF1_U_GCTPH1_US9&-redoLog=false&-_caller=geoselect&-geo_id=&-format=US-25|US-25S&-_lang=en>

[2] California. California Air Resources Board. STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING PUBLIC HEARING TO CONSIDER ADOPTION OF REGULATIONS FOR THE CERTIFICATION AND TESTING OF GASOLINE VAPOR RECOVERY SYSTEMS USING ABOVEGROUND STORAGE TANKS. Sacramento, California Air Resources Board, 2007. 115. <http://www.arb.ca.gov/regact/2007/ast07/isor.pdf>

[3] National Petroleum News. 2006 NPN Station Count (a), National Petroleum News, 2006. <http://www.npnweb.com/uploads/researchdata/2006/USAnnualStationCount/06-stationcount.pdf>

Attachment 1

Air Resources Board

Mary D. Nichols, Chairman
1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov

Linda S. Adams
Secretary for
Environmental Protection

Arnold Schwarzenegger
Governor

January 3, 2008

Dear Air Pollution Control Officer:

The purpose of this letter is to request your district's participation in a survey to collect data for the development of an emissions inventory of in-use Gasoline Dispensing Facility (GDF) hoses. The inventory will support a staff proposal to control emissions permeation from GDF hoses. Your help in this endeavor is greatly appreciated.

The enclosed survey form requests data to quantify the types and characteristics of permitted in-use GDF hoses in your district. If there are any portions of this survey that cannot be completed, please provide feedback explaining why. We are requesting that the completed questionnaire be returned by February 4, 2008 to Jason McPhee at P.O. Box 2815, Sacramento, California 95812. Also, it would be helpful if you can provide a staff contact for any future inquiries on this matter.

If you have questions or need further assistance please contact Jason McPhee at (916) 322-8116 or via email at jmcphee@arb.ca.gov, or me at (916) 322-2886 or via email at dgoodeno@arb.ca.gov.

Sincerely,

Dennis Goodenow, Manager
Regulatory Development Section
Monitoring and Laboratory Division

Enclosure

Attachment 1

Gasoline Dispensing Facility (GDF) Hose Survey Form

(District Level)

ARB staff is requesting data on in-use gasoline dispensing hoses at permitted Gasoline Dispensing Facilities (GDFs) in each district. For the following questions, please give data that corresponds to 12/31/2007. If the data set was not collected in the 2007 calendar year, please note this. Any reference to Phase II systems includes both Phase II vapor recovery and enhanced vapor recovery (EVR) systems.

Please list the district that you are providing data for. _____

GDF Population

1. Total number of existing permitted GDFs. _____
2. Total number of existing GDFs with Phase II systems. _____
3. Total number of existing GDFs with balance type Phase II systems. _____
4. Please indicate below, how the data was collected (i.e.. Permits to operate, construct, etc.).

Hose Population

5. Total numbers of GDF hoses in-use at permitted GDFs. _____
6. Total numbers of GDF hoses in-use at GDFs with Phase II systems. _____
7. Total numbers of GDF hoses in-use at GDFs with balance type Phase II systems. _____
8. Please indicate below, how the data was collected (i.e.. Permits to operate, construct, etc.). _____

Hose Dimensions (Use best judgement on aquiring this data.)

9. Average length of in-use balance type GDF hose (feet) (includes hose, whip, and fittings). _____
10. Average length of in-use vacuum assist type GDF hose (feet) (includes hose, whip, and fittings). _____
11. Average inner diameter of the outer hose wall of in-use balance type hose (inches). _____
12. Average inner diameter of the outer hose wall of in-use vacuum assist type hose (inches). _____
13. Please indicate below, how the data was collected (i.e.. Permits to operate, construct, etc.).

Number of Permitted GDFs in the Following Throughput Categories (gal/yr):

14. Up to 300,000. _____
15. 300,000 to 600,000. _____
16. 600,000 to 1.2 million. _____
17. 1.2 million to 2.4 million. _____
18. 2.4 million and up. _____
19. Please indicate below, how the data was collected (i.e.. Permits to operate, construct, etc.).

Attachment 2

Survey Results: GDF Population

Air Pollution Control District	Number of Permitted GDFs	Number of GDFs with Phase II	Number of Balance GDFs	Number of Vacuum Assist GDFs**
Amador County	43	41	34	7
Antelope Valley	138	135	111	24
Bay Area	2581	2458	2146	312
Butte County	137	103	83	20
Calaveras County	45	41	38	3
Colusa County	22	19	15	4
El Dorado County	118	78	45	33
Feather River	76	71	62	9
Glenn County	24	21	16	5
Great Basin Unified	89	55	45	10
Imperial County	143	118	70	48
Kern County	156	150	62	88
Lake County	42	31	20	11
Lassen County	18	10	8	2
Mariposa County*	52	41	34	7
Mendocino County*	108	86	70	16
Modoc County*	10	8	7	2
Mojave Desert	344	333	260	73
Monterey Bay Unified	459	426	371	55
North Coast Unified	106	89	26	63
Northern Sierra	64	64	46	18
Northern Sonoma County*	263	209	171	38
Placer County	197	180	150	30
Sacramento Metro	514	494	429	65
San Diego County	1080	892	773	119
San Joaquin Valley Unified	2720	2193	1771	422
San Luis Obispo County*	327	260	213	47
Santa Barbara County	188	188	146	42
Shasta County*	189	150	123	27
Siskiyou County*	31	25	20	4
South Coast	5298	4960	4070	890
Tehama County	36	35	27	8
Tuolumne County	35	32	28	4
Ventura County	297	272	195	77
Yolo-Solano	222	170	136	34
Totals	16172	14438	11821	2617

* District failed to respond to the survey. Numbers were estimated by staff for this district.

** Vacuum Assist numbers were obtained by subtracting Balance numbers from Phase II numbers.

Attachment 3

Survey Results: Hose Population

Air Pollution Control District	Number of hoses at Permitted GDFs	Number of Vapor Recovery Hoses	Number of Balance Hoses	Number of Vacuum Assist Hoses**
Amador County	158	154	120	34
Antelope Valley	1115	1112	825	287
Bay Area	20865	20595	17405	3190
Butte County	1000	853	680	173
Calaveras County	185	173	164	9
Colusa County	314	294	236	58
El Dorado County	660	450	242	208
Feather River	608	603	522	81
Glenn County	181	174	137	37
Great Basin Unified	358	318	253	65
Imperial County	1030	996	513	483
Kern County*	1050	1027	889	138
Lake County	267	225	163	62
Lassen County	244	164	60	104
Mariposa County*	348	340	295	46
Mendocino County*	725	709	614	95
Modoc County*	71	69	60	9
Mojave Desert	2248	2229	1669	560
Monterey Bay Unified	2630	2597	2148	449
North Coast Unified	628	423	188	235
Northern Sierra*	431	421	365	57
Northern Sonoma County*	1770	1730	1498	232
Placer County	1440	1421	152	1269
Sacramento Metro	3690	3600	3000	600
San Diego County	8695	8495	7316	1179
San Joaquin Valley Unified	14365	13838	10593	3245
San Luis Obispo County*	2202	2152	1863	289
Santa Barbara County	1362	1362	1041	321
Shasta County*	1272	1243	1077	167
Siskiyou County*	208	203	176	27
South Coast	102595	100860	89254	11606
Tehama County	359	357	259	98
Tuolumne County	244	232	210	22
Ventura County	2482	2452	1685	767
Yolo-Solano	1494	1386	1080	306
Totals	177295	173257	146750	26507

* District failed to respond to this portion of the survey. Numbers were estimated by staff for this district.

** Vacuum Assist numbers were obtained by subtracting Balance numbers from Phase II numbers.

Attachment 4

Survey Results: GDF Population by Population Density*

Air Pollution Control District	Population (People)	Land Area (mile^2)	Population Density (People / mile^2)	Permitted GDFs / People / mile^2	Phase II GDFs / People / mile^2
Amador County	35100	593	59	0.7	0.7
Antelope Valley**	298908	1421	210	0.7	0.6
Bay Area**	6605945	5521	1197	2.2	2.1
Butte County	203171	1639	124	1.1	0.8
Calaveras County	40554	1020	40	1.1	1.0
Colusa County	18804	1151	16	1.3	1.2
El Dorado County	156299	1711	91	1.3	0.9
Feather River	139149	1233	113	0.7	0.6
Glenn County	26453	1315	20	1.2	1.0
Great Basin Unified	32006	13986	2	38.9	24.0
Imperial County	142361	4175	34	4.2	3.5
Kern County**	112148	3419	33	4.8	4.6
Lake County	58309	1258	46	0.9	0.7
Lassen County	33828	4557	7	2.4	1.3
Mariposa County	17130	1451	12	*4.4*	*3.5*
Mendocino County	86265	3509	25	*4.4*	*3.5*
Modoc County	9449	3944	2	*4.4*	*3.5*
Mojave Desert**	400725	19200	21	16.5	16.0
Monterey Bay Unified	710598	5156	138	3.3	3.1
North Coast Unified	167047	7759	22	4.9	4.1
Northern Sierra	116412	4465	26	2.5	2.5
Northern Sonoma County	56731	946	60	*4.4*	*3.5*
Placer County	248399	1404	177	1.1	1.0
Sacramento Metro	1223499	966	1267	0.4	0.4
San Diego County	2813833	4200	670	1.6	1.3
San Joaquin Valley Unified**	3190644	23857	134	20.3	16.4
San Luis Obispo County	246681	3304	75	*4.4*	*3.5*
Santa Barbara County	399347	2737	146	1.3	1.3
Shasta County	163256	3785	43	*4.4*	*3.5*
Siskiyou County	44301	6287	7	*4.4*	*3.5*
South Coast**	14920816	11488	1299	4.1	3.8
Tehama County	56039	2951	19	1.9	1.8
Tuolumne County	54501	2235	24	1.4	1.3
Ventura County	753197	1845	408	0.7	0.7
Yolo-Solano**	289744	1469	197	1.1	0.9
Totals and Statewide Averages	33871648	155959	217	4.4	3.5

* Note that this survey uses GDF numbers taken from this 2008 survey while the population and land information are taken from the 2000 Census.

** Because these districts comprise multiple counties and fractions of counties, populations and land areas are estimated for these districts from the 2000 Census.

Italicized entries indicate unresponsive districts which have been assigned the Statewide Average.